US Army Corps of Engineers
Waterways Experiment Station

Aquatic Plant Control Research Program

Vol A-98-1 August 1998

APIS —The Aquatic Plant Information System

by
Michael J. Grodowitz, John D. Madsen, Sherry G. Whitaker, Lavon Jeffers, and Robert Michael Stewart

The capability of aquatic plant managers to successfully control aquatic plant infestations is highly dependent on their ability to access pertinent and up-to-date information on scores of topics within the broad areas of ecology, biology, and environmentally compatible management techniques.

Such a task is becoming increasingly difficult because the existing knowledge base—in the form of technical reports, journal articles, oral presentations, videotapes, etc.—is already sizable and is increasing rapidly. An efficient mechanism is needed to access such diverse and important information.

Toward this goal, researchers at the U.S. Army Engineer Waterways Experiment Station have developed a computer-based information system known as APIS (the Aquatic Plant Information System).

The APIS program is the result of combining several information systems into one integrated package. Among the components are systems to identify insect herbivores of aquatic plants, an aquatic plant identification system, and research-grade information systems to identify male leaf-mining flies in the genus *Hydrellia* and to determine the physiological age of emale *Neochetina eichhorniae.*

APIS also includes the information contained in APROPOS (the Aquatic Plant Resource Operations and Planning Online Support), as well as upgraded versions of the HARVEST, AMUR, and HERBICIDE models.

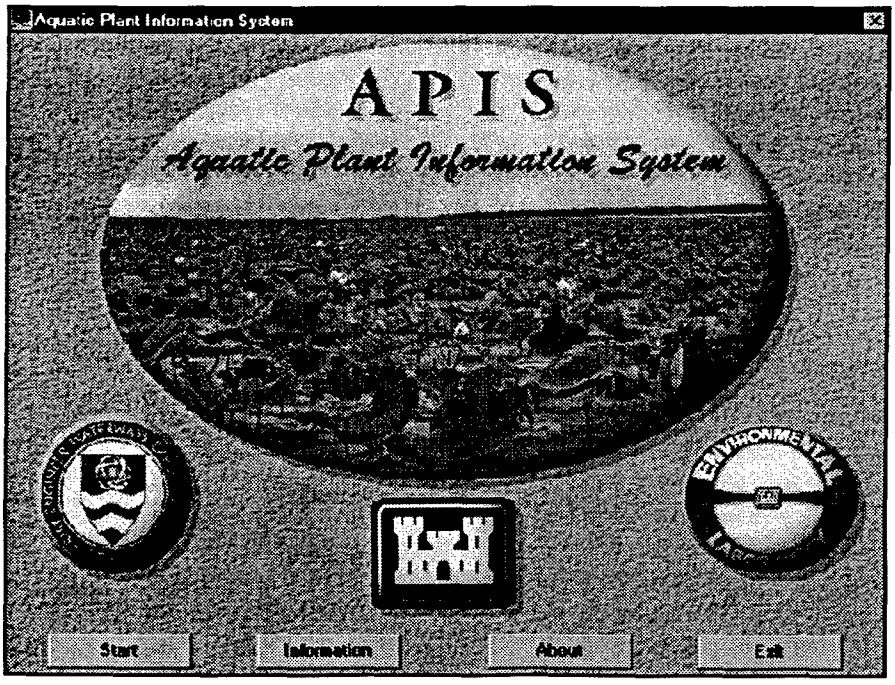


Figure 1. Title screen from the Aquatic Plant Information System

System requirements

APIS is a personal computer-based program that operates under the Windows environment (Figure 1). Windows supports com puter programs that are highly graphical in nature and uses a "point-and-click" interface. Windows also simplifies the use of program on computers with vastly different hardware and software configurations. In addition, the Windows operating environment allows programs to incorporate high-quality photographic images and hyperlinked help files.

Minimum system requirements for APIS are a 486SX 25-MHz processor capable of displaying 256 colors simultaneously, a 2X CD-ROM, and the Windows 3.1 operating system. APIS will also operate under Windows 95; however, the system must be able to display at least 65,000 colors simultaneously.

Figure 2. Information manager screen from the Aquatic Plant Information System. Access to information is accomplished by clicking on any one of the icons located on the left-hand side of the screen

General operation and information content

System operation is simplified with the use of a highly intuitive graphical user interface. Information access is accomplished through icons located on the left-hand side of the information manager (Figure 2).

Topics that can be accessed via these icons include aquatic plant biology/ecology/distribution, insect herbivore ecology and biology, aquatic plant and insect identification, management options, and analytical models.

Additional information relates to native plant restoration, basic ecology of aquatic plants, general references, and available WES research facilities.

A user's guide is accessible directly from the program, further simplifying the operation of APIS.

Many identification systems are accessible through APIS. These systems help identify 61 aquatic plants, the insect herbivores of 18 commonly encountered aquatic plants, male leaf-mining flies in the genus *Hydrellia*, and the introduced insect agents for alligatorweed, waterhyacinth, waterlettuce, and hydrilla (based on their associated damage). One component also identifies physiological age-grading characteristics for female *Neochetina eichhorniae*, an important biological control agent of waterhyacinth.

The identification portions of APIS utilize expert system-type programming, which closely simulates the interaction between technical and nontechnical personnel. The systems operate in a similar manner, to allow identifications using relatively easy-to-observe characteristics.

For example, for plant identification, the computer queries the user on important identifying characteristics through high-quality photographic images and, if necessary, further information is given via text-based hyper-linked files (Figure 3).

After a plant is identified, the system allows access to hyper-linked files containing information on plant introduction, distribution, description, biology, ecology, and associated problems. Other icons allow the display of photographic images of important plant characteristics and photographs of the plant population under field conditions (Figure 4).

Returning to the information manager allows access to plant-specific chemical, biological, or mechanical control options (Figure 5). This is accomplished by selecting the "Control Icon" from the left-hand side of the information manager and choosing, from the newly displayed icons, the appropriate management area. Following this selection a screen is displayed, and the user is given access to information on any number of specific control methods.

For the biological control and mechanical control sections, a list of the appropriate technology-specific techniques is displayed. Selecting a specific technique allows access to detailed and summary information on the chosen item, as well as point of contacts for additional information.

For the chemical control section, the user can select the most appropriate chemical based on user-specified characteristics (Figure 6). Examples of site-specific information entered by the user include water use restrictions, specific regions or states in which the chemical will be applied, flow rate, and water quality conditions.

After answering a series of questions designed to target the most appropriate active ingredient, the user can view detailed information on application rates, use restrictions, toxicological data, available formulations, and application techniques.

In addition to the identification sections of APIS, three previously developed simulation models—AMUR, HARVEST, and HERBICIDE—can be run directly from the APIS information manager.

AMUR helps users evaluate proposed white amur stocking rates and subsequent impact to noxious aquatic plant growth. HARVEST helps determine the mechanical harvesting costs and production rates with different mixes of equipment and site conditions. The HERBICIDE simulation model produces output data needed to understand the impacts of site conditions on active ingredient fraction dissipation of different herbicide formulations.

AMUR and HARVEST have been updated considerably, allowing for more simplified operation and understanding. The HERBICIDE model was changed only to allow it to run efficiently within the APIS environment.

In addition to the three Windows-based models, the files and installation instructions for two DOS-based models (INSECT and HYDRIL) are also included on the APIS CD-ROM.

The INSECT model is a population-based simulation for *Neochetina*, an important insect biocontrol agent of water-hyacinth. HYDRIL is a population-based model for *Hydrilla verticillata*. Both of these DOS-based models operate indepen-dently of APIS.

APIS includes information on several other aspects of aquatic plant management. These sections present information on the ecology of the plants and associated management techniques, describe other WES-operated aquatic plant research facilities, and explain the use of native plantings for the management of noxious aquatic vegetation. These topics are presented as hyper-linked text files with associated illustrations and photographic images.

In addition, extensive overall and section-specific reference lists are included to aid users in locating other important sources of information.

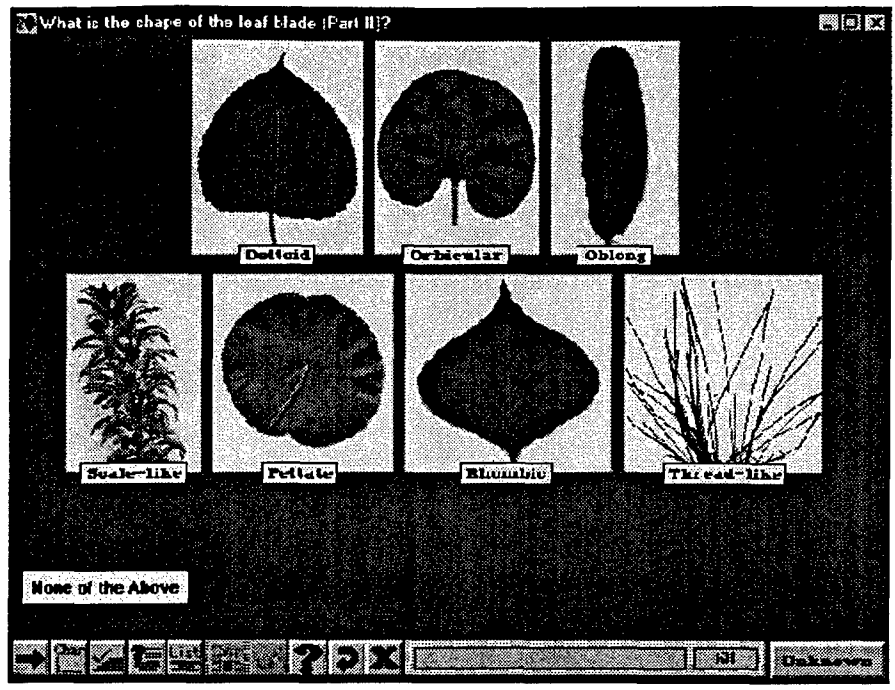


Figure 3. Question screen from the plant identification portion of APIS. Note how each character for the question listed on the tile bar is clearly displayed through high-quality photographic images. By selecting the appropriate icon located along the bottom of the screen, the user gains access to more detailed textual or illustrative information for the displayed question, to overall information on the use of the identification system, to available species or items, or to a listing of the questions

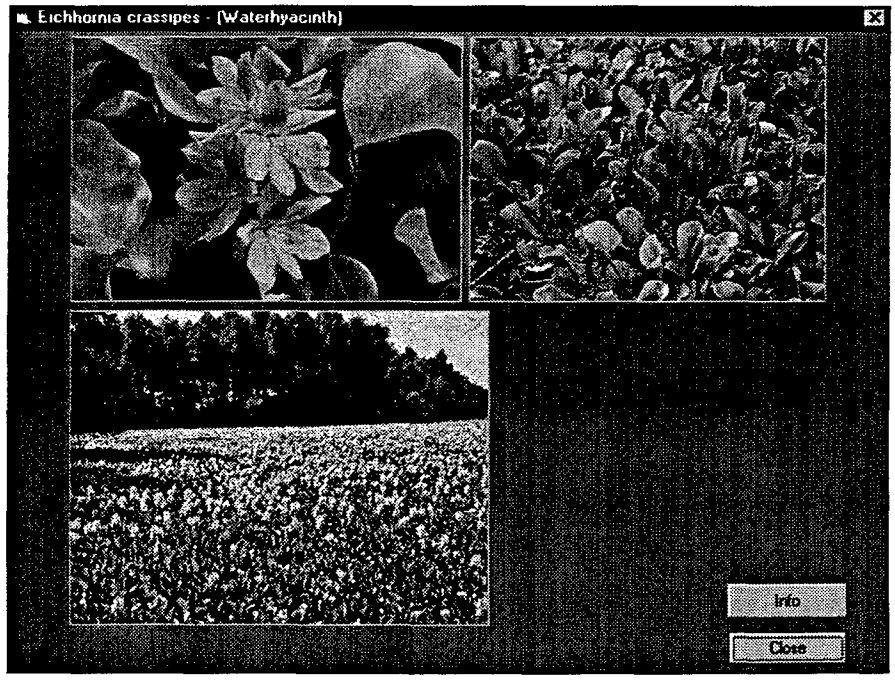


Figure 4. After selecting a plant from either the plant identification portion of APIS or from the plant list, full-color photographs can be displayed easily by selecting the camera icon or double-clicking on the plant picture located in the middle of the Information Manager. For most plant species, a series of photographs are used to illustrate all aspects of the plant, including close-ups of the flower, the plant, and population views. Access to plant-specific hyperlinked text files can be accessed by clicking on the "Info" button

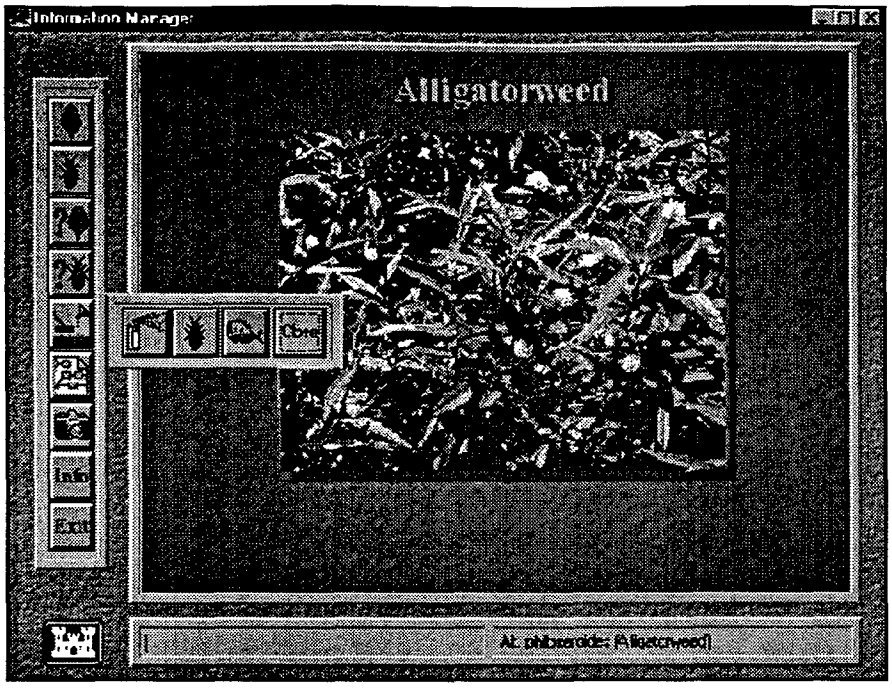


Figure 5. Information manager screen, showing how the user can access plant-specific management options. Selection of a specific management option is tied directly to the plant selected or identified. In this case, all three management areas are applicable since the three icons—representing chemical, biological, and mechanical control options—are displayed in full color (that is, illuminated)

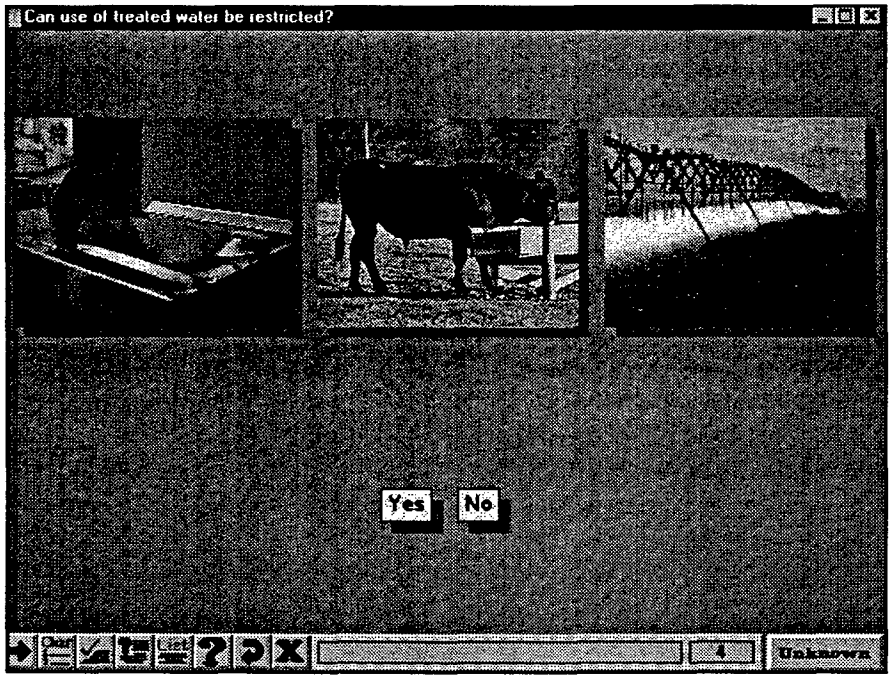


Figure 6. Users have the option of selecting the most appropriate herbicide by entering information on site characteristics. This information is entered by answering a series of questions concerning site location, water-use restrictions, flow rate, etc. This allows the user easy access to expert rules-of-thumb used in selecting the most appropriate herbicide for the target location

Summary

APIS is a Windows-based information system that allows rapid and efficient access to a wide range of information on aquatic/wetland plant identification and management. Because of its highly intuitive and interactive interface and its large quantity of information, it should prove useful to both technical and nontechnical users.

Aquatic Plant Information System

Minimum system requirements:

- 486SX 25-MHz processor
- 256-color (simultaneous) display capacity
- 2X CD-ROM
- Windows 3.1 (see note)

NOTE: APIS can operate under Windows 95 if the system can display at least 65,000 colors simultaneously.

Availability of APIS

APIS is scheduled to be released in late summer 1998. Copies will be available free of charge on a first-come, first-serve basis.

Requests for APIS should be directed to:

Dr. Michael J. Grodowitz
U.S. Army Engineer Waterways Experiment Station
ATTN: CEWES-ER-A
3909 Halls Ferry Road
Vicksburg, MS 39180-6199
Phone: (601) 634-2972
Fax: (601) 634-2398
E-mail: *grodowm@mail.wes.army.mil*

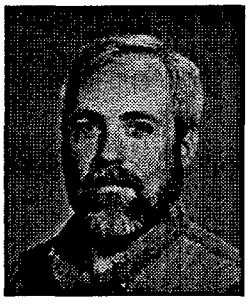
Information about the authors:

Dr. Michael J. Grodowitz is a Research Entomologist and Team Leader at the U.S. Army Engineer Waterways Experiment Station (WES), Environmental Laboratory. His studies focus on the use of biological control for the management of noxious and nuisance plant species. Dr. Grodowitz holds Bachelor and Master of Science degrees in Biology from the University of Southern Mississippi and a Ph.D. in Entomology from Kansas State University. He can be reached at (601) 634-2972, *grodowm@mail.wes.army.mil*.

Dr. John D. Madsen is a research biologist at WES and serves as Team Leader for the Aquatic Plant Ecology Team. He conducts research on the ecology, management, and restoration of aquatic plants. Dr. Madsen holds a Bachelor of Science degree from Wheaton College and Master of Science and Doctor of Philosophy degrees in Botany from the University of Wisconsin-Madison.

Sherry G. Whitaker is a senior programmer/analyst for DynTel Corporation, stationed in the WES Environmental Laboratory. Her primary focus is the creation and maintenance of information/expert systems. Ms. Whitaker holds a Bachelor of Science degree in Mathematics and Computer Science from the University of Southern Mississippi and is currently pursuing an M.S. in Computer Science from Mississippi State University.

Lavon Jeffers is an analyst/programmer for DynTel Corporation also stationed in the WES Environmental Laboratory. He specializes in the design and maintenance of graphical interfaces for information/expert systems. Mr. Jeffers holds an Associate of Arts degree in Graphic Design and Advertising from Hinds Community College.



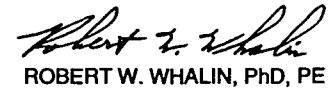
Robert Michael Stewart, a research biologist in the WES Environmental Laboratory, is currently a part of the Aquatic Plant Ecology Team. His work focuses on field evaluations of operational approaches for effectively managing aquatic plant communities. Mr. Stewart has Bachelor and Master of Science degrees in Biology from the University of Southern Mississippi.

US Army Corps
of Engineers

This issue describes APIS—the Aquatic Plant Information System. APIS is a Windows-based information system that allows rapid and efficient access to a wide range of information on aquatic/wetland plant identification and management. APIS components identify 61 aquatic plants and the insect herbivores of 18 commonly encountered aquatic plants, and provide extensive data to aid in choosing management options.

Aquatic
Plant Control
Research Program

This bulletin is published in accordance with AR 25-30 as one of the information dissemination functions of the Environmental Laboratory of the U.S. Army Engineer Waterways Experiment Station. It is principally intended to be a forum whereby information pertaining to and resulting from the Corps of Engineers' nationwide Aquatic Plant Control Research Program (APCRP) can be rapidly and widely disseminated to Corps District and Division offices and other Federal and State agencies, universities, research institutes, corporations, and individuals. Contributions are solicited, but should be relevant to the management of aquatic plants, providing tools and techniques for the control of problem aquatic plant infestations in the Nation's waterways. These management methods must be effective, economical, and environmentally compatible. The contents of this bulletin are not to be used for advertising, publication, or promotional purposes. Citation of trade names does not constitute an official endorsement or approval of the use of such commercial products. This bulletin will be issued on an irregular basis as dictated by the quantity and importance of information to be disseminated. Communications are welcomed and should be addressed to the Environmental Laboratory, ATTN: Dr. John W. Barko, U.S. Army Engineer Waterways Experiment Station (CEWES-EV-E), 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, or call (601) 634-3654.



ROBERT W. WHALIN, PhD, PE
Director